UNBOUND NOTES AND DRAWINGS

UNDATED, MENLO PARK PERIOD (1879-1881)

Different Buttons.

Of all substances so far tested in the telephone for increasing and decreasing the resistance of the circuit by the effect of the sonorous vibrations, lampblack from the lighter hydrocarbons is the best, ~~The~~ It is very essential that the lampblack should be deposited at the lowest temperature possible ~~although~~ & that the flame of the lamp should never play upon the deposit, otherwise the product is of high resistance and unsuitable for this purpose, Commercial Lampblack even the best scarcely allows a current to pass through it while the lampblack & obtained by my process has scarcely any resistance, The lampblack as it comes from the burning apparatus is laid upon a white slab and those portions that have a brownish tinge are picked from the pile, The remainder

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is ~~then~~ ~~pass~~ ground in a mortar and then placed in a large mould & subjected to a pressure of a ~~several~~ thousand pounds. The cake thus pressed is ~~again~~ repowdered & repressed several times, finally it is weighed out in lots of 300 milligrammes & moulded into buttons as seen in the telephone.

The reason why lampblack thus moulded is superior to any other substance is satisfactorily answered when we consider that of all finely divided substances ~~such~~ obtained either by mechanical action or chemical precipitation lampblack is ~~shown~~ under the microscope to ~~have~~ the greatest number of particles or in other words to be the most finely divided. Now it has been proven beyond contradiction that the increase and decrease of resistance of any button of finely divided

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Conducting matter when subjected to pressure is due entirely to the contact of a greater or lesser number of particles at the junctions or surfaces, when thus subjected to pressure; ~~Again~~ it is known that the telephone is equally sensitive to the slightest change of resistance in the circuit, hence; if a button of gas retort Carbon composed of metallic particles few in number (as compared to lampblack,) is used in a telephone the production of a wave by gradually increasing pressure is obtained by the gradually increasing number of particles which are brought in contact with the surface palate, now these particles are so few & large and in many cases several particles aggregated together in the retort carbon that ~~thus contact wave is made impure wave~~ the wave contributed of being pure is harsh & grating. This wave may be graphically represented

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by a line included at an angle of 45°; with teeth like that of a hand saw; the teeth representing the ~~irregularities~~ disturbance of the current by the effect of the particles themselves, Now if the button of gas retort Carbon be replaced by one of graphite which is composed of much smaller particles with no aggregations as with the first, The wave will ~~be pure~~ be represented by the line as above but the teeth will be scarcely perceptible, and these gaps being so minute are beyond the power of the telephone to detect hence we obtain a pure wave; but ~~for a given amount of pressure~~ these gaps weaken the wave as a whole by their effect on the self induction of the telephone receiver; But in the case of lampblack. The particles are infinitely finer than graphite, and moreover the button is somewhat elastic

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hence the line representing the form of the wave will be perfectly straight, although theoretically there are gaps, they are infinitely small as compared to graphite or other conducting substance, Lampblack when moulded into buttons has another property which no other conducting substance has and that is its elasticity. for instance if we subject buttons of different substance to pressure, the greatest diffusion of resistance with a given weight will be produced on the lampblack button, again if we increase the weights on all the buttons, a point will be reached where any additional weight ~~will~~ ceases to reduce the resistance appreciably Excepting on the case of the lampblack which continues to show decrease of resistance with several times the weight placed upon it that are upon the other buttons,

I have endeavored to ascertain ~~the~~ roughly the number of points of contact on intro Lampblack ~~Carb~~ button now used, to aid me I placed under the microscope a Rutherford deffraction grating having 17,294 lines ruled ~~on the~~ on speculum metal within a space of one inch, beside of this I placed a button of lampblack, then by changing from one to the other, I calculated that there were not less than 10 millions of points ~~used~~ upon the surface of the button nearly all of which were constantly in use when ~~been~~ subjected to the various vibrations Had the Rutherford grating been ruled both ways, we should have had 298 million of points, and there is little doubt that the button of platina ruled double ~~in~~ this manner would give good results in the telephone, but would not equal the lampblack as its elasticity brings a greater greater number of points in contact as the pressure is increased which would

17294
17241
17291
15-5619
34582

not be the case with the ~~[illegible]~~ rubber button,

~~[illegible]~~ The elasticity of the lamp black button has another advantage inasmuch that it allow a considerable initial pressure to be placed upon it. ~~thus preventing~~ without materially reducing its sensibility, hence the apparatus is not so liable to be thrown out of adjustment as those employing an inelastic button, where the initial pressure must be exceedingly light to retain its sensibility when adjusted in the manner a loud sound causes a break in the circuit & the sounds are harsh and disagreeable, = The only defect if it may be called one which the button of lampblack has is that it is somewhat friable, but my own experience is that if the telephone is made in a proper manner so that no part of it will under the effect of the sounds ~~means~~ hammer the button that it ~~will last for~~ has lasted for months & as far as I can see will

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to last as long as the instrument which holds it, but if the instrument is so designed that the armatures are allowed to hammer the button ~~it~~ ~~are~~ or if the initial pressure is very light and the instrument receives a violent concussion by being dropped on the floor the button is liable to ~~break~~ crack but even in this case the volume of sound is not greatly decreased, I have attempted to harden these buttons by mixing the black previous to moulding with sugar or tar etc and after moulding subjecting them to high heat. This makes them hard but inelastic, but still far superior to any other substance,

After Lampblack the best substance is Graphite, then follow Hyperoxide of lead, gas carbon, Iodide of Copper, ——

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although theoretically there will be alternate interruptions practically there will be none

Kneeded in the fingers and has the appearance of a semi transparant wax. The solvent power of white Thyme is the greatest. The other volatile oils have no such effect.

V Paper left for two weeks in a ~~[illegible]~~ weak solution of Manganate of Soda is completely disintegrated and when dry ~~may be~~ may be crumbled to a fine black powder.

V If a small peice of Silicum be placed between the carbon points of an electric light and a weight be placed upon the upper vertical carbon, the passage of the Current will heat the Silicum and Cause the electric arc to appear This continues indefinitely, the Silicum preserving the continuity of the arc both by its Conductivity, and by its presence as a seperator of the two Carbons. I have only tried it with elements of high internal resistance, Boron does not answer so well.

No 3

Laboratory Notes

No 4

Laboratory notes -

If one of the poles of ~~50 cells of~~ a battery of 50 Bunsen cells be ~~armed~~ connected to a ~~stout~~ platina wire and the other pole connected to a series of disks of different metals to contact of the platina wire with any one of them will give the electric arc. But if a condenser of 10 microfarads capacity be connected from pole to pole the electric arc cannot be obtained but in its place ~~very~~ beautiful scintillations are obtained. These scintillations are only seen on the contact of the platina point with the metallic disks and not on disconnecting. They ~~scintillation~~ shoot out from the point of contact like the rays of the sun ~~and~~ with inconceivable rapidity and ~~and~~ in the case of iron reach a length of from ½ to 20 inches. ~~The scintillations are characteristic each metal has it peculiar scintillation not in color.~~ The scintillations of the different metals are peculiar not on account of their color but on account of each metal producing scintillations of a different character peculiar to itself. ~~so that~~ an alloy of several metals gives a compound discharge in which the peculiar scintillations of each metal is seen, for instance. Iron gives scintillations having the shape of a cigar and are great in number, with Aluminum they are ~~gives~~ thick straight and few in number and after shooting out several inches suddenly turn downward at right angles. with lead there are ~~in~~ an enormous quantity which are as fine as the finest spider web -

No. 4.

Laboratory Notes.

(DYNAMOS)
1880

If the speed of the Steam Dynamo is 600, and the Receiving Dynamo is of the same dimensions & revolution then the latter when doing no work will run at 600, or more exactly speaking say 595, the lessened speed is due to the friction of the machine, now the maximum work we can get from it will be when the Receiver is running at 300 revolutions, But if the ~~receiver~~ Resistance of the Receiver

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is changed it may be made to revolve at 1200 Revolutions while the Steam Dynamo is going but 600, and by adding work until it is brought down to a speed of 600 the maximum will be obtained, But the maximum work is not the most economical it is the same as a Steam Engine there is small Economy in taking steam to the full stroke & getting the maximum power of the Engine but let it cut off Early & we get the most Economical work all of which you well know hence, we only work the Receiving Dynamo

3

up to 20 or 25 pc of its
Capacity.

The speed of the Dynamo
like an Engine will
vary ~~as~~ speed according
to load. if there is no
governor: but the variation
of speed due to change
of load is only 1/4 what
it would be in an ungoverned
Engine, owing to the Law of
the Dynamo - Where Even
speed is required with
variable work we put on
an automatic variable
Cut off on the receiving
Dynamo & it works in a perfectly

4

analogous manner to
~~the~~ Steam governor & ~~auto~~
Cut off -

The Article in the Franklin
Inst Journal is not correct
in many particulars

Our device for reducing
Speed we find is not
Essential in your case
as we can now increase
the diameter of our
Dynamo 6 x 6 in to such
an Extent that the surface
Velocity of the periphery
being the same as in a smaller
6 x 6 in allows of a very

much slower shaft speed, and it can be done by a couple of spur gears -

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Menlo Park, N. J., ... 1880.

polarized so that with the regular current the lever remains unattracted but if the ~~Operator~~ engineer at the Station reverses the direction of the flow of the current on the rails. the polarity is such that the polarized magnet is energized the lever is attracted and the direction of the current through the ~~magn~~ bobbin is changed as the motor is stopped and goes in the opposite direction ~~A mere reversal of the Current will not alter the~~ The motor always goes in one direction independent of the direction of the current, only the reversal of one magnet in relation to the other

T. A. EDISON 8

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magnet alters the direction of rotation; thus I am enabled to move trains back and forward from the station without any person being on the train. To the motors a number of cars may be attached ~~and~~ as in the ordinary way; magnetic or hand brakes may be attached to these cars and worked by a current derived from the track. The train may be also lighted from derivations or multiple arc circuits across the track,

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Menlo Park, N. J., 1880.

for crossing trains at the stations

8 Certain kinds of tissue paper if cut in strips and laid upon the palm of the hand, will curl and uncurl at regular intervals for hours, but on the hands of some persons it cannot be made to ~~curl at~~ do so at all, no matter how often the attempt is made ~~endeavor to make it do so~~ =

9 ~~Nearly all~~ Many bottles containing substances in solution show upon their sides placed nearest to the wall ~~a bow of least exposed to the light~~ - a bow running from the surface of the liquid on one side nearly to the cork and thence to the surface of the liquid on the other side. this bow is composed of small drops of liquid = The smaller the amount of liquid the higher the bow which is generally sharp & well defined =

10. A 20 gramme solution of gum dextrine in 100cc of water smells after 4 months exactly like sweet Cider =

11 Crystals of proto sulphate of iron turn white only in that part of the bottle receiving the greatest amount of light =

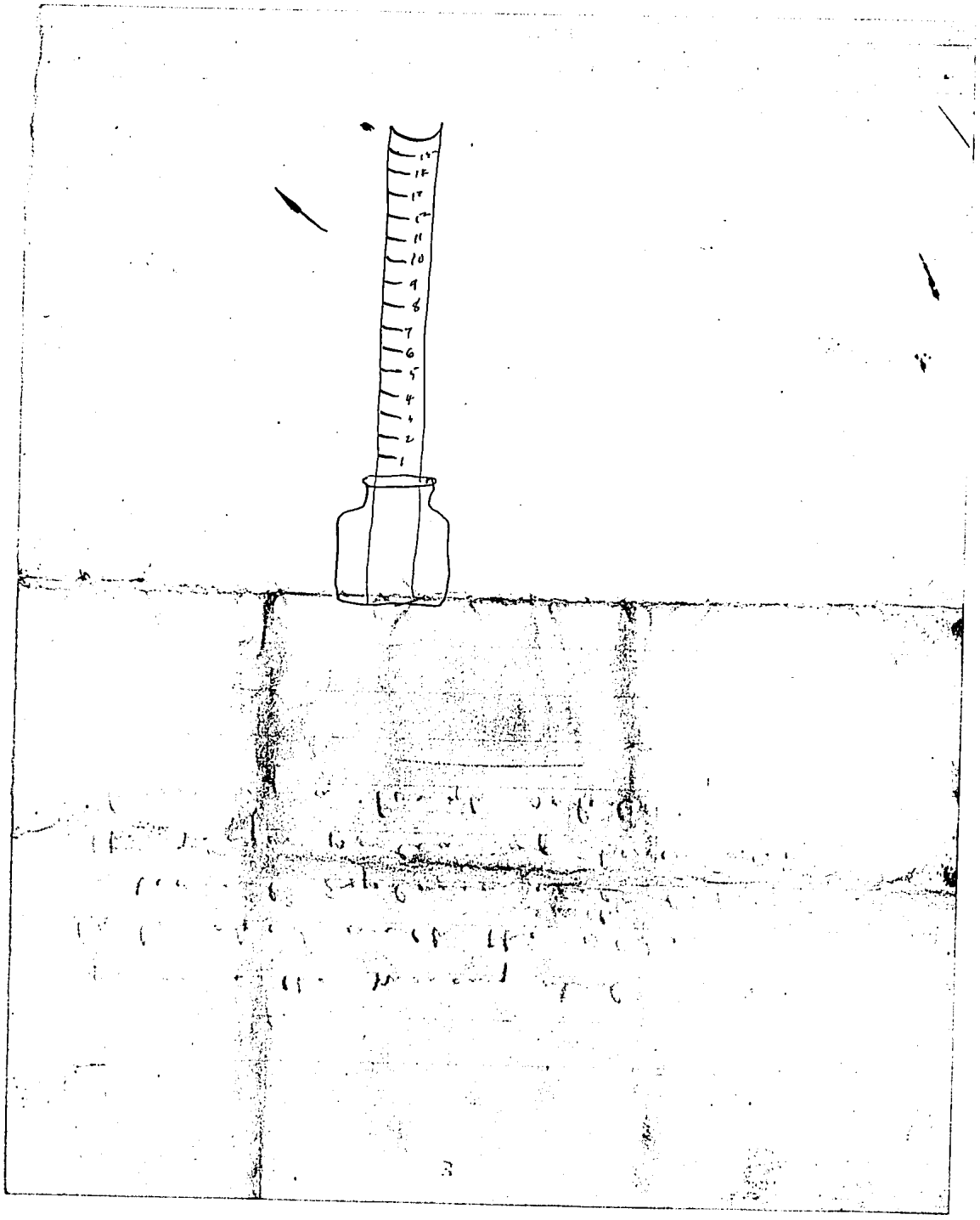
12 The smoke from the burning of Camphor, when inhaled has a powerful effect on the lungs ~~if inhaled~~ causing spitting of the blood. ~~The effect~~ ~~A Phosphorus~~ is much more powerful ~~[illegible]~~ than Sulphurous Acid Chloride of Bromine ~~[illegible]~~ etc

13. ~~If~~ Nitro Benzole is a good solvent for intra-cellulose, or soluble gun Cotton ~~like Ether~~

14 - Bi Sulphide of Carbon ~~[illegible]~~ instantly kills ~~all~~ every kind of mould which I have been able to procure; The Colorado Beetle which seem proof against the most ~~powerful~~ corrosive chemicals is instantly killed by it = Its vapor acts as well = Perhaps they are frozen by the cold produced with rapid evaporation but ether does not have the same effect

~~14~~ 15 If a small quantity of mercury be placed in a shallow dish and a piece of ~~sodium~~ Metallic Sodium be placed on it ~~the mercury~~ quite a lively agitation of the surface of the mercury will take place if now one pole of a Bunsen cell b

placed in the mercury and the Sodium
be touched with the other a
a Violent Explosion instantly ~~will~~ takes place.
the major portion of the whole.
becoming a tough solid substance.



3 ounces zinc dissolved to make 1 Cubic foot Hydrogen

Roughly 1 lb Zinc in battery Equals 5 feet gas or one gas jet per hour. Cost to the Gas Co 1/2 cent

Cost in battery for Zinc, 9 cents. chromic acid ——.

Etc –

5 grammes of Venice Turpentine
1 gram Cometic Potash
100 cc H₂O. with strip of
paper immersed within
few weeks deposit of whole crop of
crystals on the paper & in bottom
of bottle = these crystals when
dissolved in fresh water are
strongly in quantity =

If not called for in 10 days return to
T. A. EDISON,
MENLO PARK,
N. J.

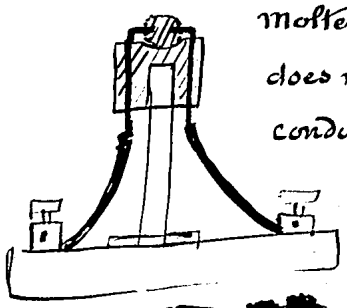
	Cometic	grams 5	grams 20	100.	400	grams 1600
Lampblack						
Hypersulphate						
Iodide Copper						
Graphite						
Gas Carbon						
Platinum Black						

Electric Light - Sketches & Notes

Experiments

Fuse equal quantities of carbon & silicon with O.H. pipe (powdered) = Test resistance =.

Gramme Machine, Platinum Grid - .020 covered with something that dont combine with platina, put it on thick - bake, and then weigh - keep incandescent all day. weigh every 3 hours = then break off covering weigh & gauge & look at under Micro =



Molten non-volatile compound that does not combine with platina and conducts – when liquid

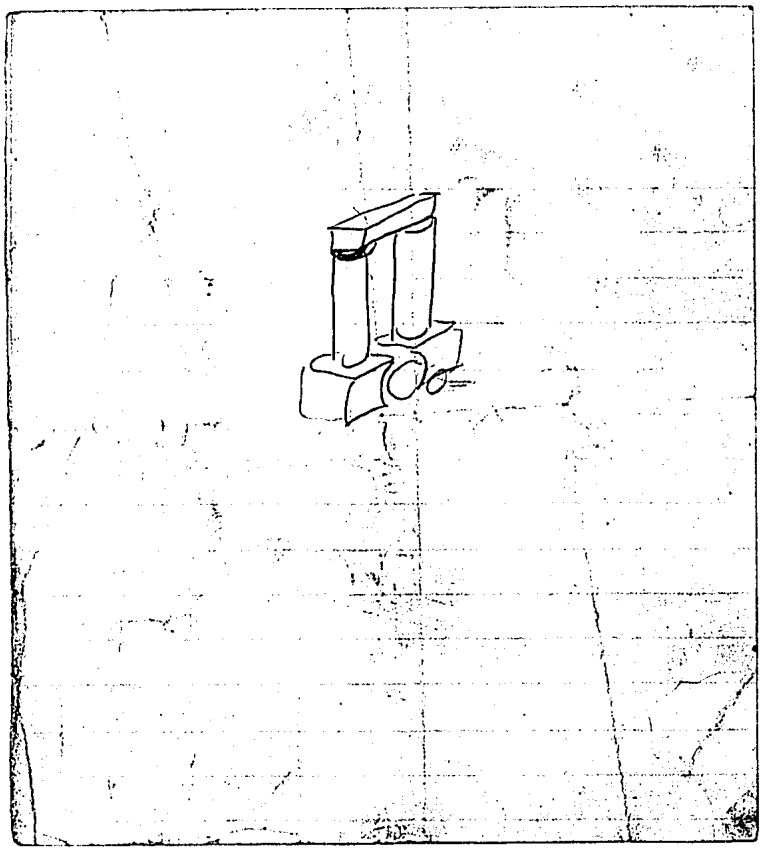
Try aluminum Electrode[redacted] 4 feet
the Induction Coil also Z[redacted]
also magnesium [redacted]896

2

In making contact between finely divided conducting material claim frosted platina or platina with myriads of points. for instance as in electrodeposition –

Better design
Brush handle held by friction
Brush holders must have
better more solid design and
better spring + adjusting screw
Try pulling mica together
with plaster paris
Brushes on K [illegible]
made thinner so it won't
chatter more than 3 [illegible]
perhaps even all thin as [illegible]
brushes would [illegible]

Ask Dean [illegible]
with those 5 [illegible]
Burden —
Try diff cements [illegible]



Cyanide of Silver gives Cy below red without fusion or melting Cobalt Cy Ag
some vaporization etc -

Chl Zinc keeps melted
up to 700 fahr without
Emitting inconsiderable
amount of fumes its
generally employed to
Keep objects at a high
temperature by Carburizing

Its absorbs Ammonia freely
perhaps Could use it in Vac

~~Zinc Chl for battle Vacts with~~

T. A. EDISON,

Menlo Park, N. J., 1880.

Thes experiments

you take a long & thin foil of Gold ~~in the middle~~, or better platina, then roll it into a helice a long & thin tin foil until the surface of the tinfoil is almost equal to the surface of the platinum

Wynnch Bailey also.
of Spark -

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Menlo Park, N. J., 1880.

10X10

Length. Cylinder 20 long over all,
guide bar & Crosshead - 25 inches
bar Cylinder & guide bars 10 inches
~~[illegible]~~ 18 Center shaft,
beyond Center Shaft 18 inches.

width, center line Cylinder
to bearing 4 inches bearing
10 inches - to

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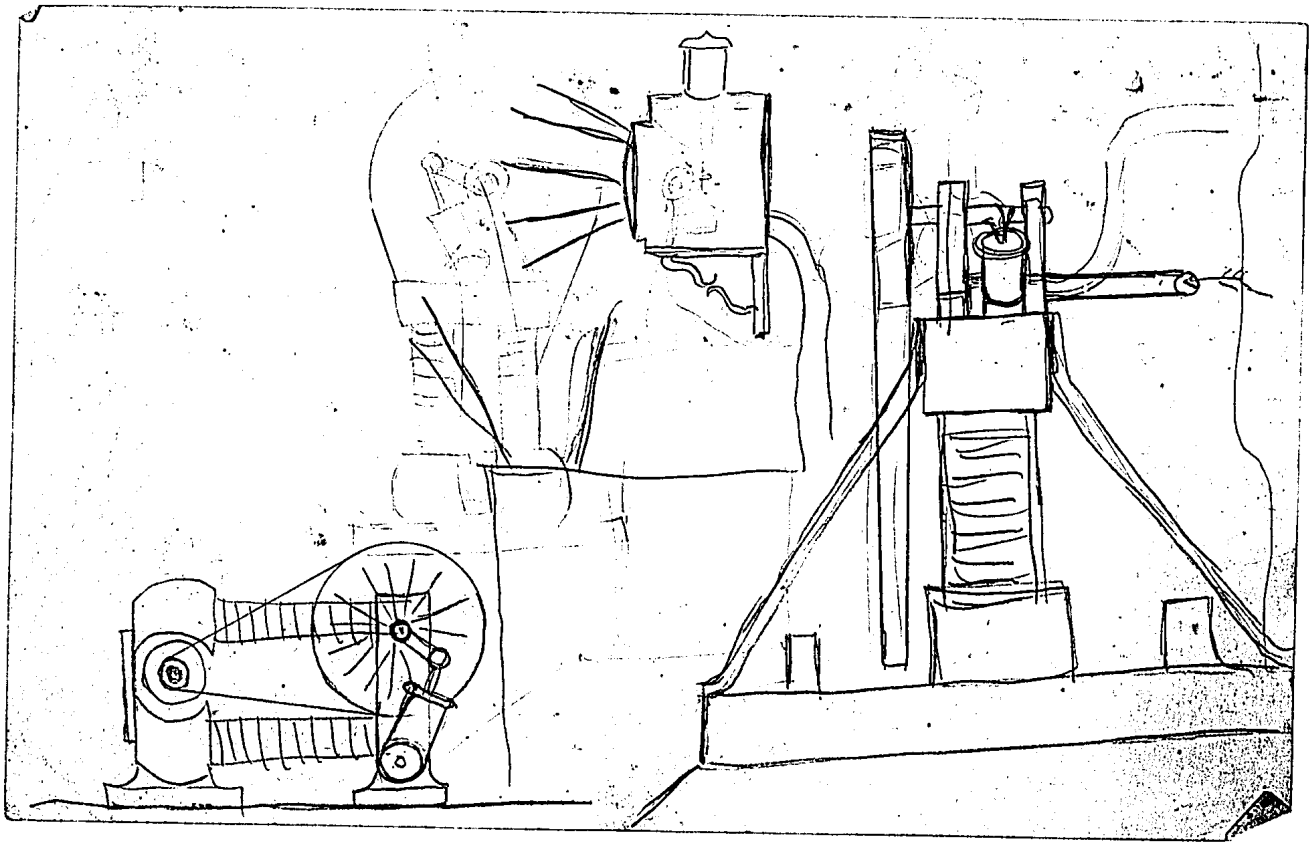
Menlo Park, N. J., 1880.

Mott Make a pictorial of drawing of the new method of Carbonizing

Baldwell gave you the drawing of the furnace the fork the chamber with gas. papers An block also of the plates with the slits in where the fibres are placed for carbonizing -



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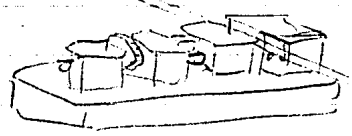
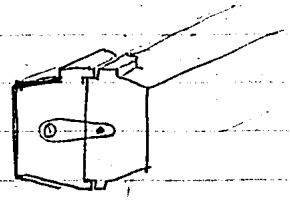
Menlo Park, N. J., 1880.

Matt.

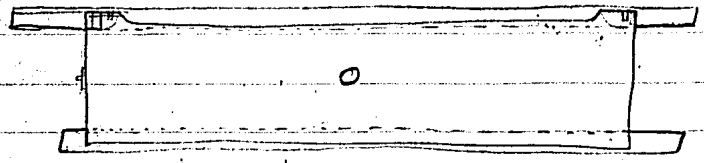
Make Patent office drawing for the new method of Cutting fabrics that Jim is using



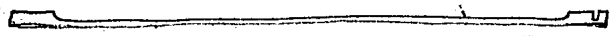


Thus

Top to finish



bottom to get a flat surface



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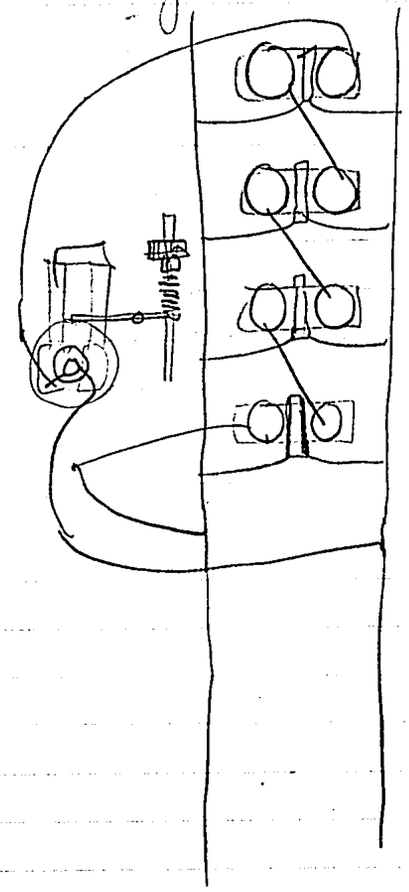
Menlo Park, N. J., 1880.

Regulating



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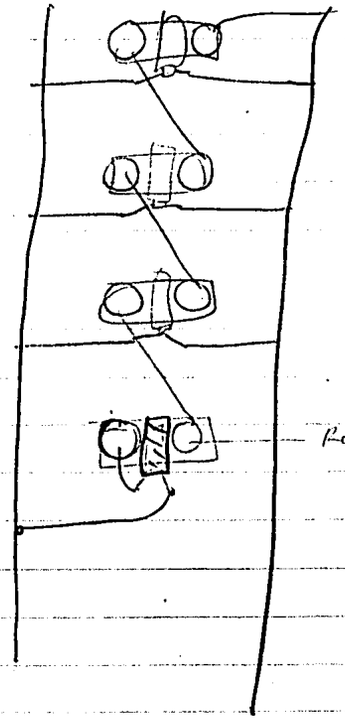
Menlo Park, N. J., 1880.



T. A. EDISON,

Menlo Park, N. J., 1880.

treating an organic salt of Lead.

How do you finely divide metallic lead by immersing metallic iron or Zinc in a solution containing a lead salt such as the acetate of Lead

Depositing finely divided metallic lead by electrolysis of the acetate of lead with lead plates

T. A. EDISON,

Menlo Park, N. J., 1880.

Carbonates Compt R XXXII. 1851 — 295 — NY

Chevreuse — Anal de Chem XXIX 1825 426 Selen (Tins)

Silliman Jnl XLII 1842 Selen 71 74 = Chevret

Anal Chem + Physique (Experiments on Carbon) NY XLII 1802 · 121

Ann de Chem I 1816 16 —

Carbon: NY

Compt R XXXVII (37) 1853 369 — Deposits —

Faraday Phil Trans 1825 440 446 — Selen

Silliman Jnl 5 1822 361

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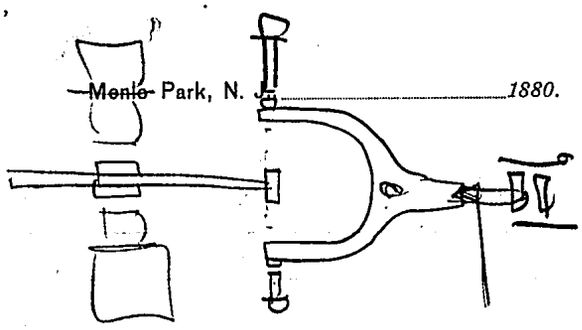
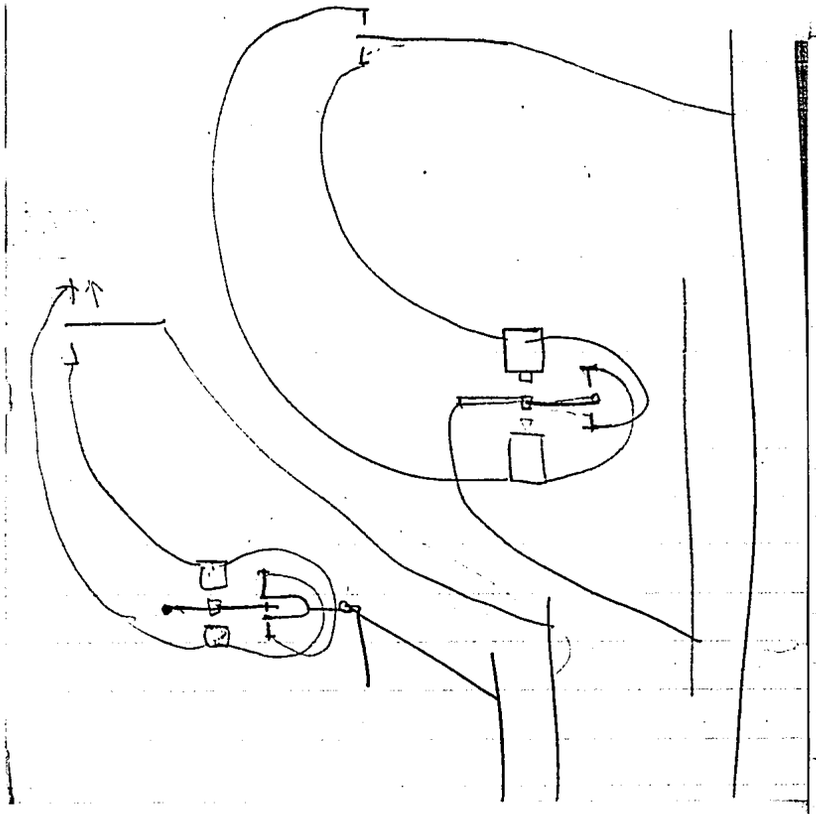
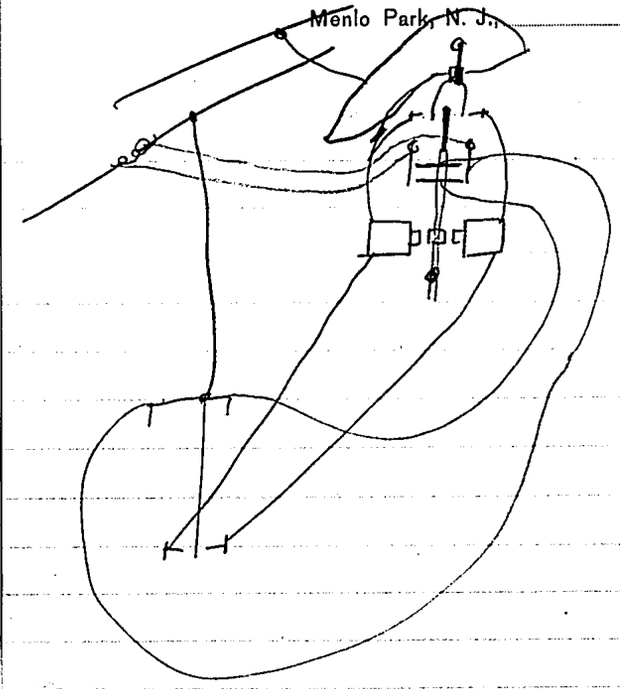
Menlo Park, N. J. 1880.





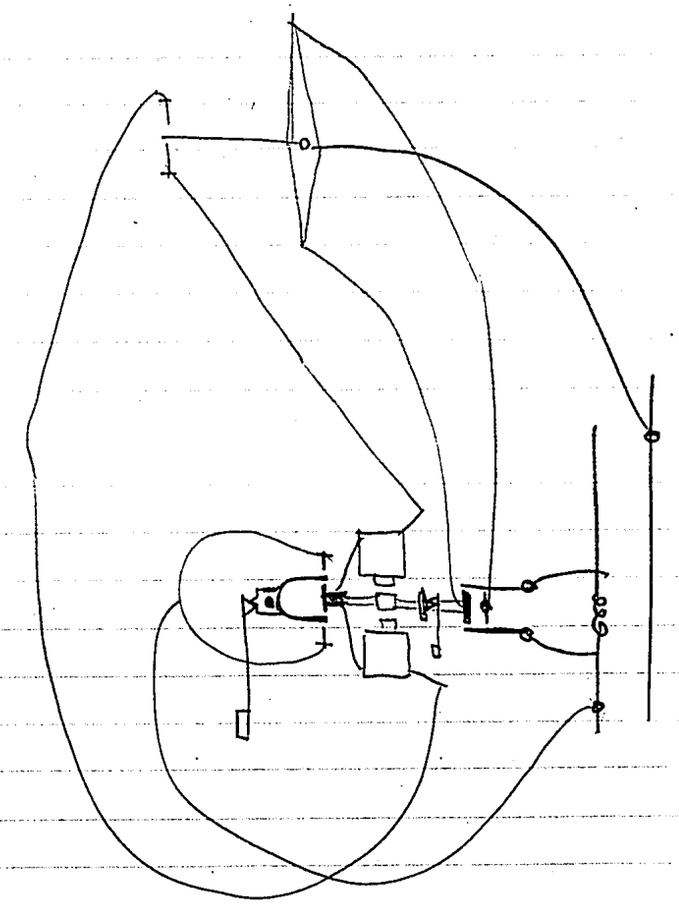
T. A. EDISON,

Menlo Park, N. J. 1880.



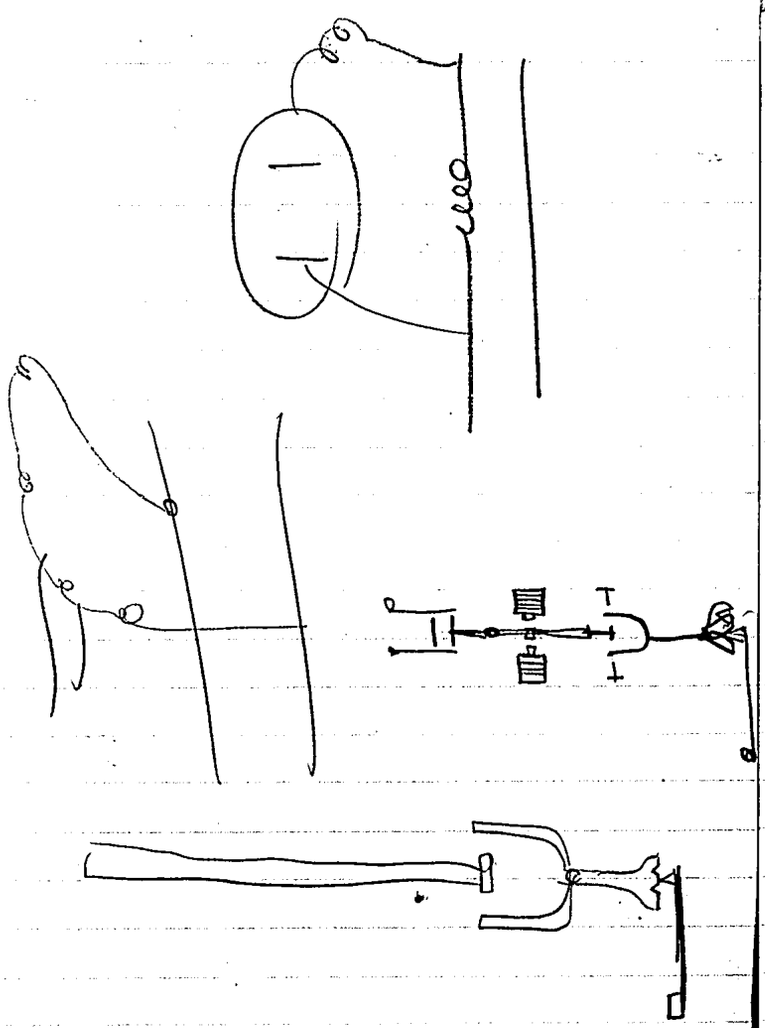
T. A. EDISON,

Menlo Park, N. J., *1880.*



T. A. EDISON,

Menlo Park, N. J., 1880.



T. A. EDISON,

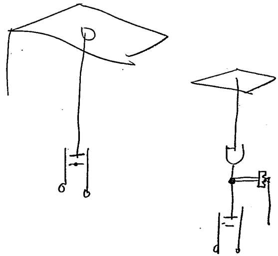
Menlo Park, N. J., 1880.

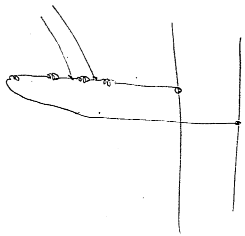
1 lb Copper.	30
1 lb Vitriol	12
Glass Jar	50
Top & with Bolts	75
Beam.	35
Hangers on Cup	25
Pendulum & Cartel	15
bottom Contacts.	20
Base.	30
Extras.	30
	322

Relay.	2.00.
Counter.	2.00
Box for all.	1 00
	5.22

4 1 50.000.

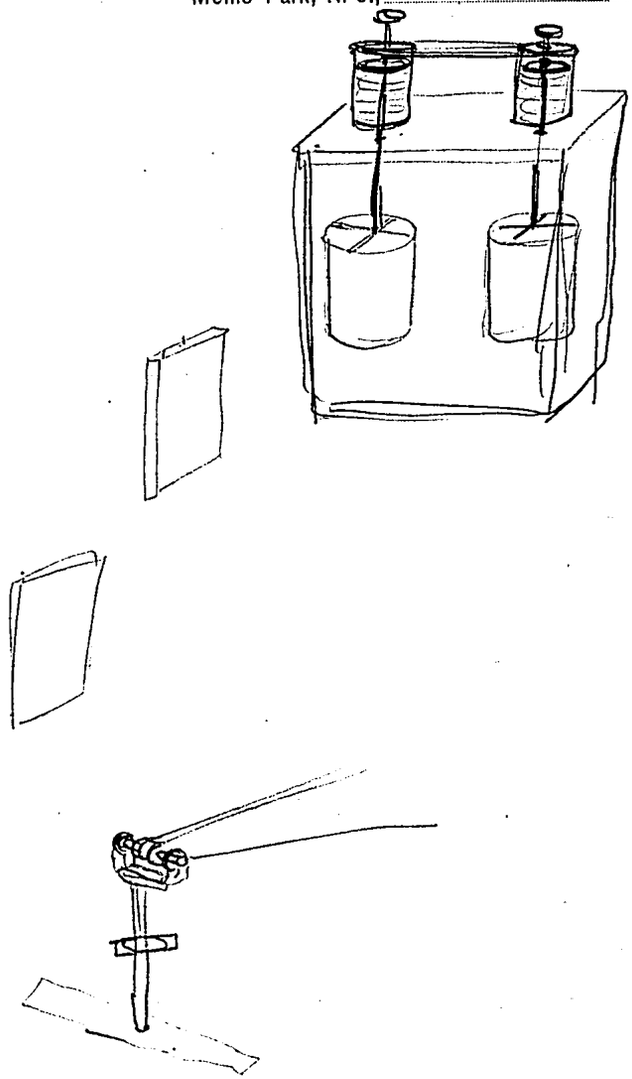
130
130
3900
130
169
676
696
743
4mm | 7 18.5
370
185.
2x | 2000
200





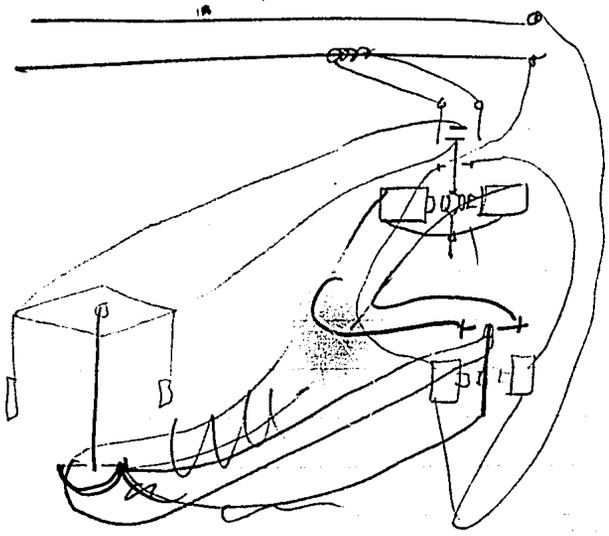
T. A. EDISON,

Menlo Park, N. J., 1880.



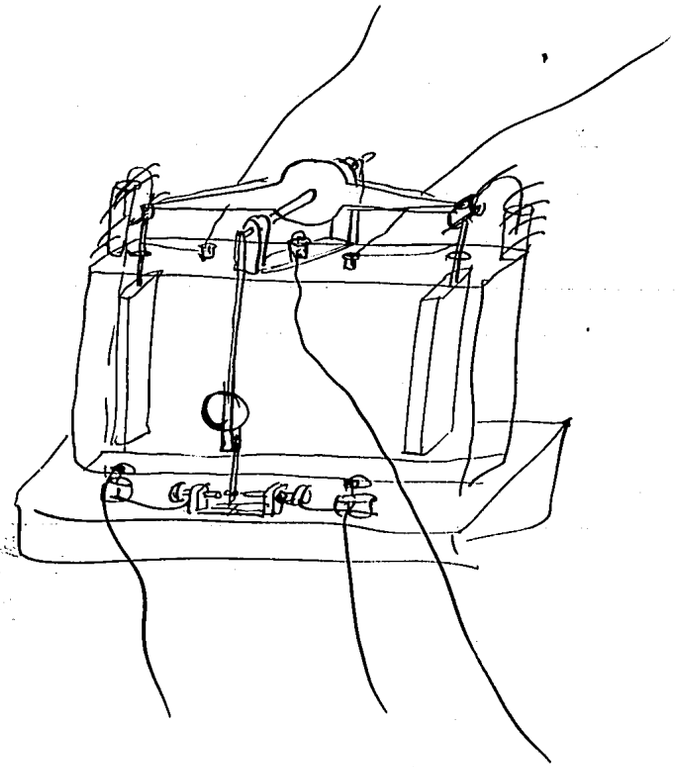
T. A. EDISON,

Menlo Park, N. J., 1880.



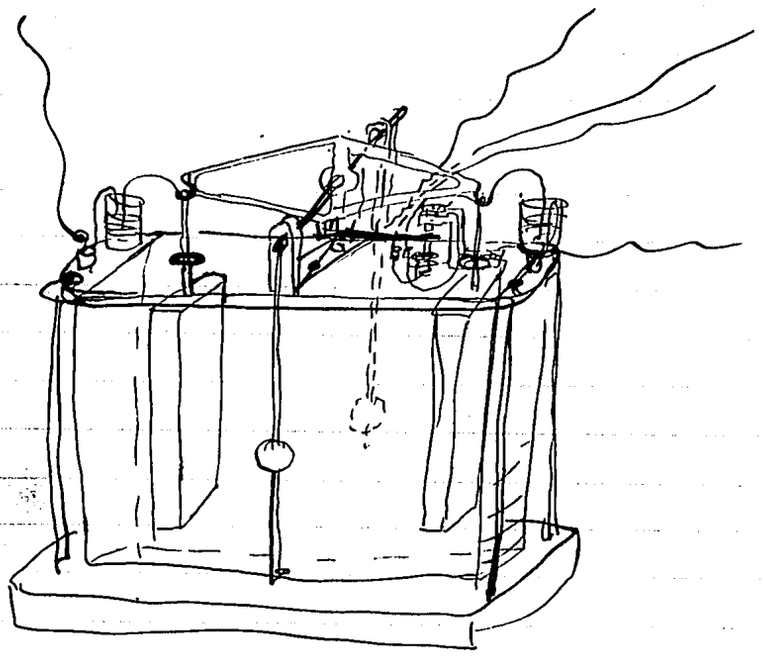
T. A. EDISON,

Menlo Park, N. J., *1880.*



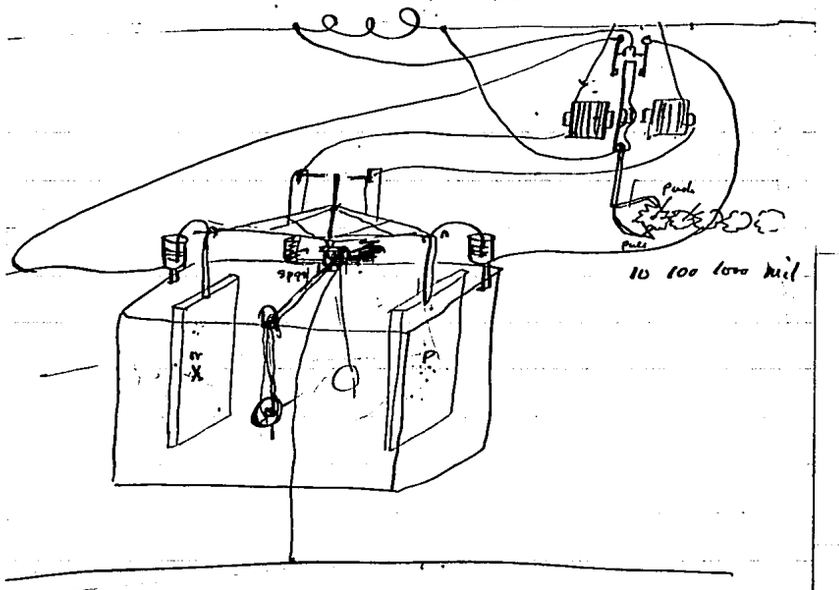
T. A. EDISON,

Menlo Park, N. J., *1880.*



T. A. EDISON,

Menlo Park, N. J., 1880.



T. A. EDISON,

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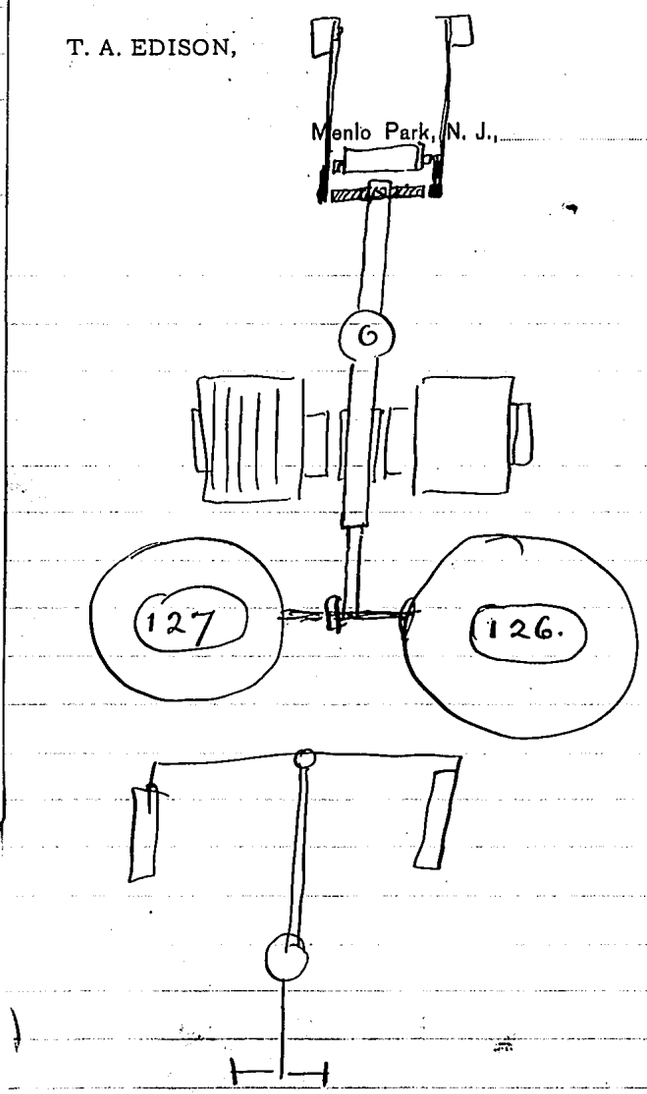

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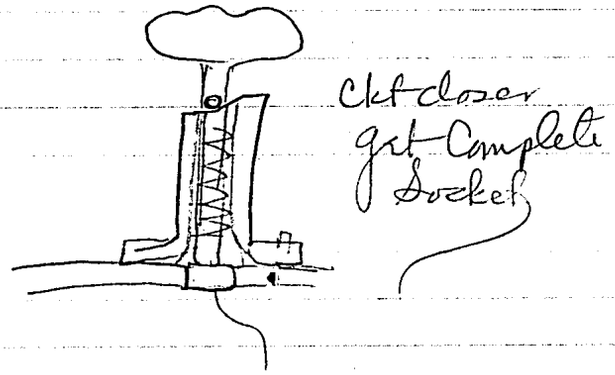

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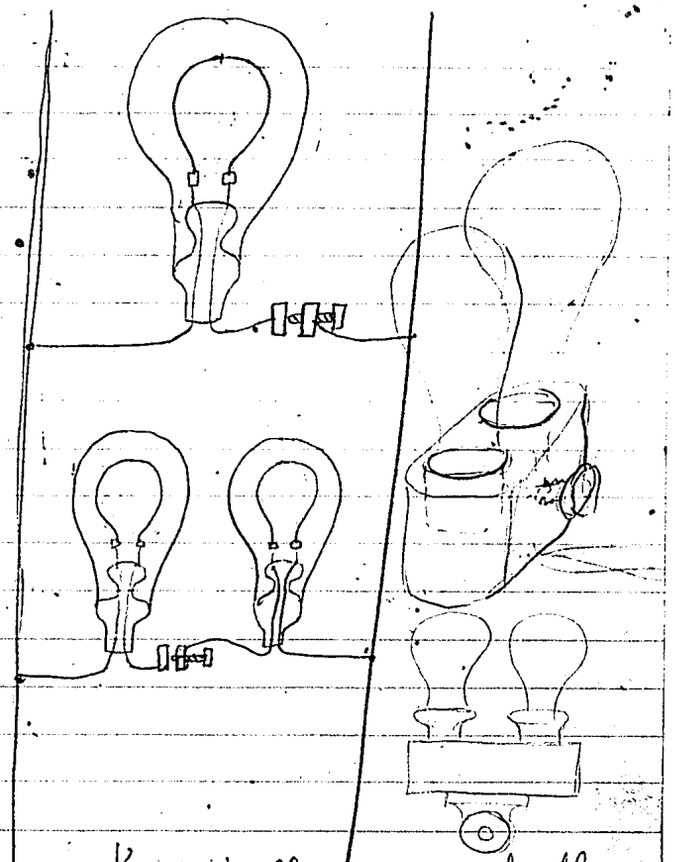
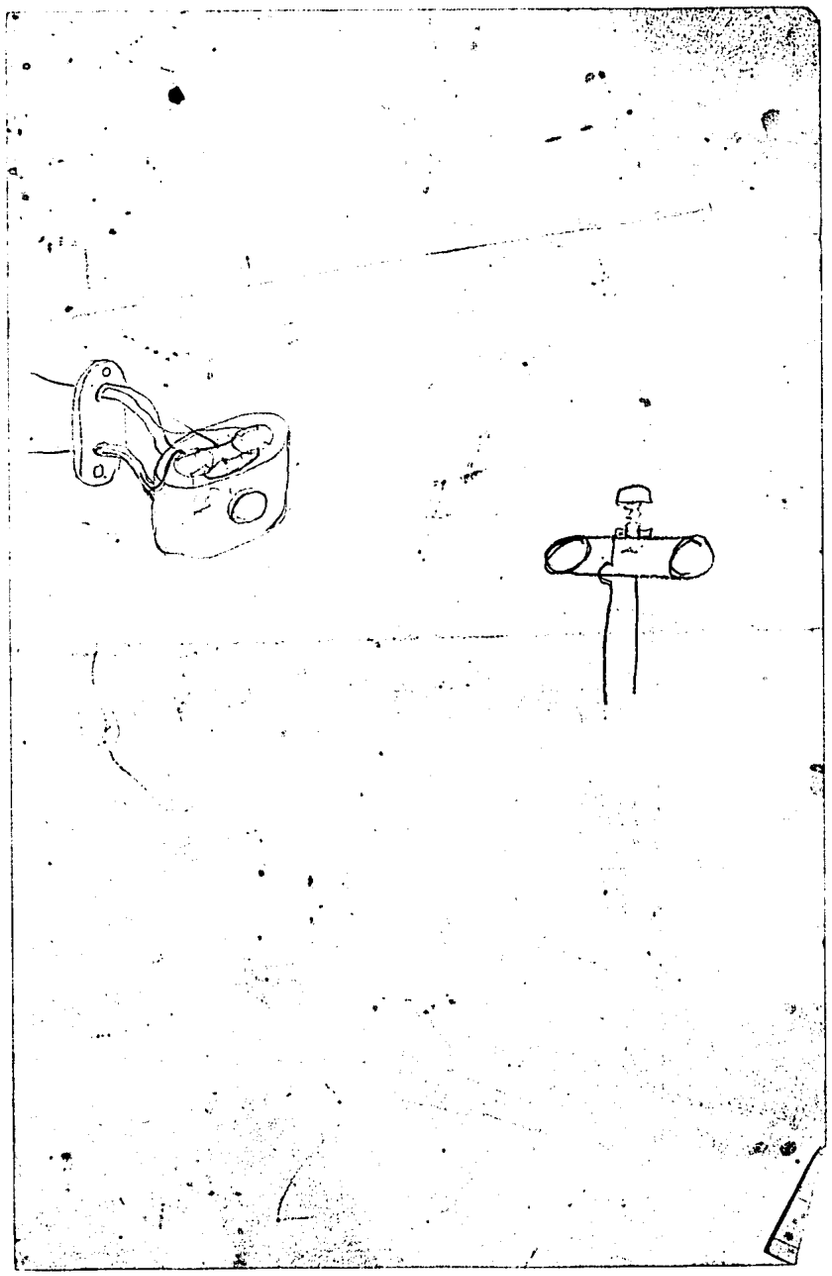


Kruezi will give you a double holder where two lamps are put in one socket on one bracket show this



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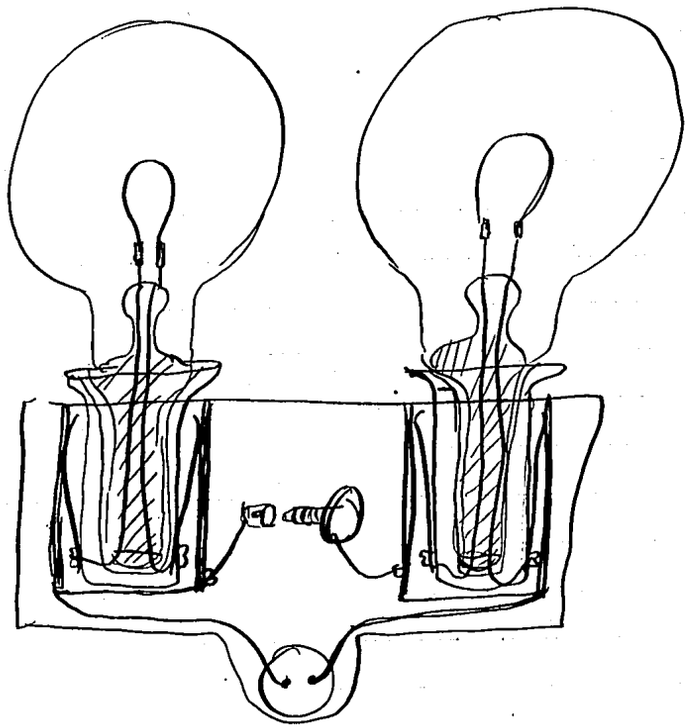
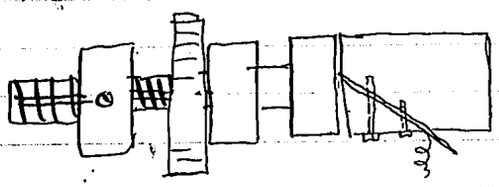
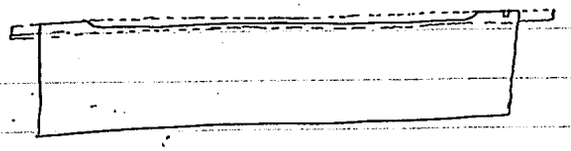


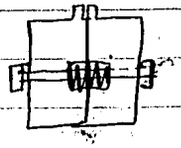
T. A. EDISON,

Menlo Park, N. J., 1880.

Patent.







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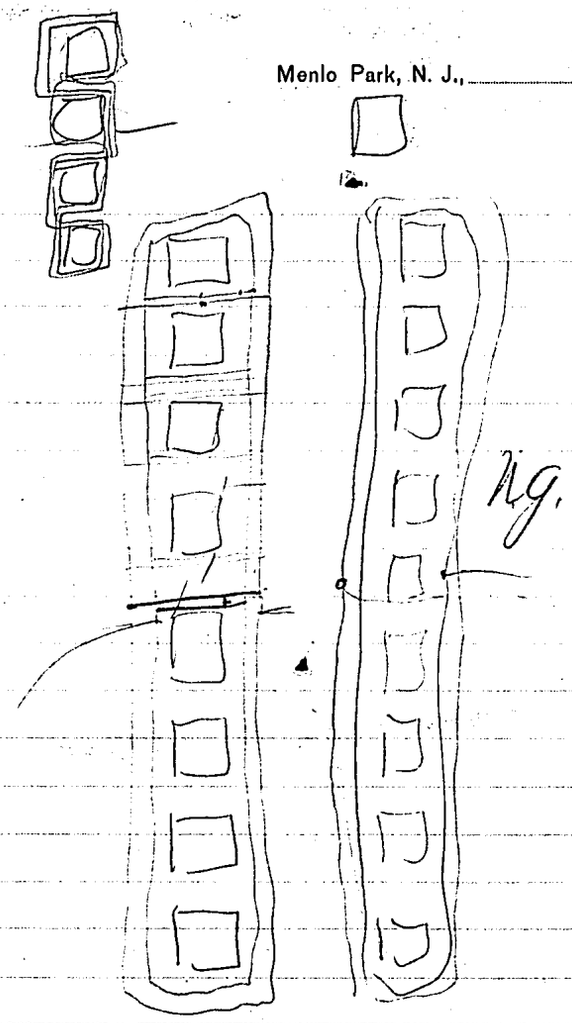

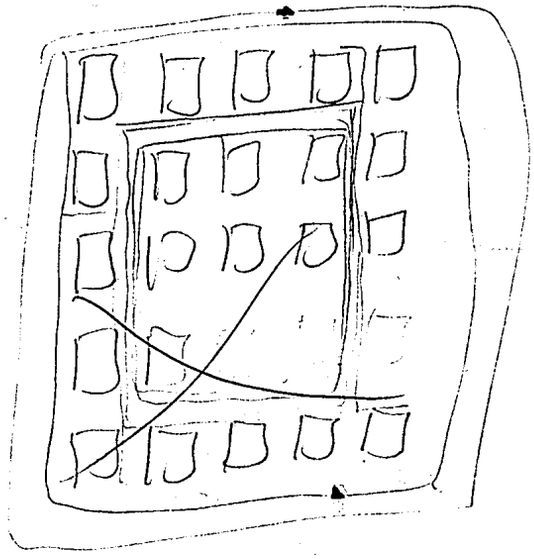

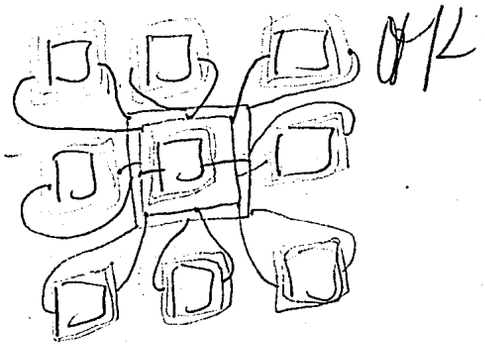
OK

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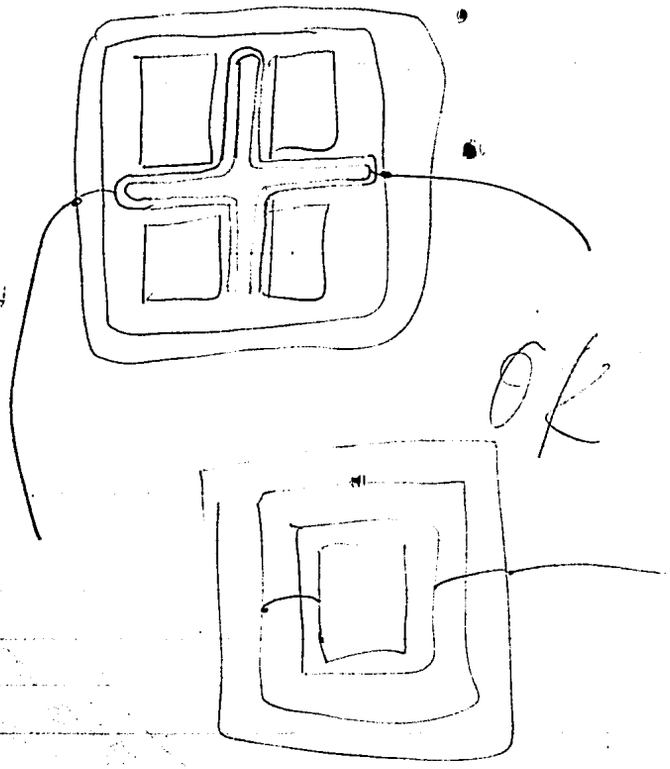

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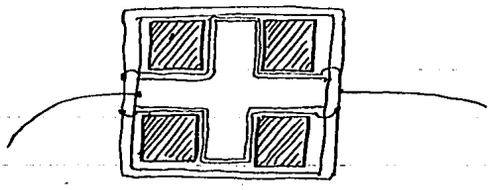

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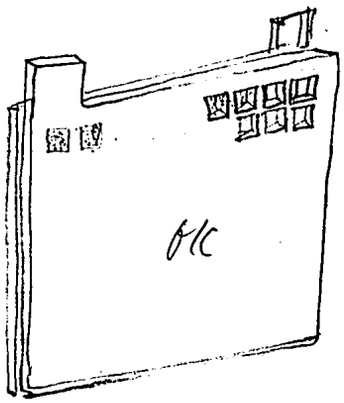

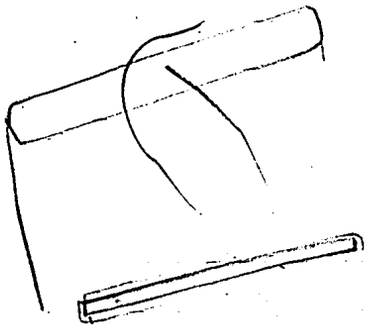

T. A. EDISON,

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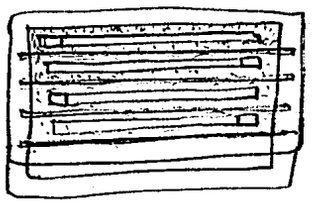
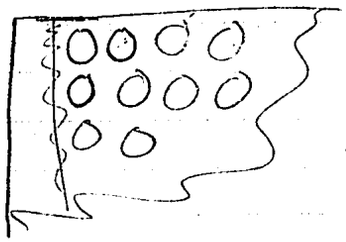
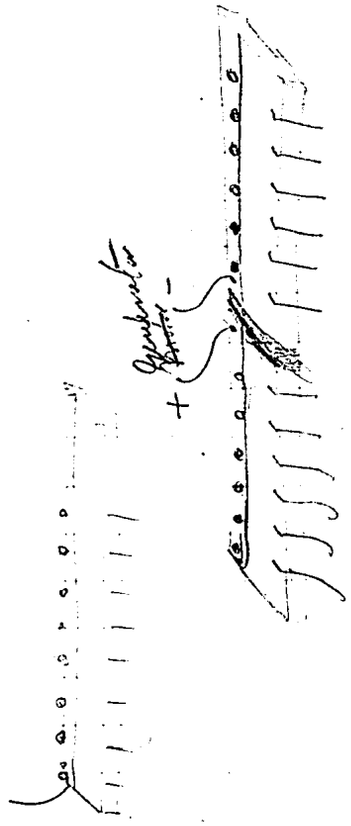




T. A. EDISON,

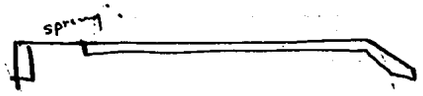
Menlo Park, N. J., 1880.



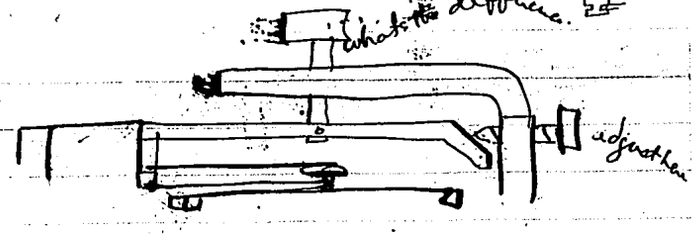
T. A. EDISON,

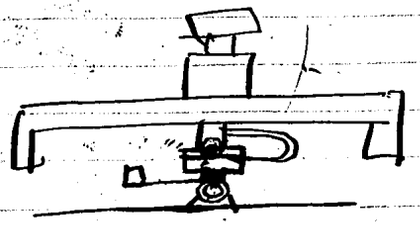
Menlo Park, N. J., 1880.

Note.



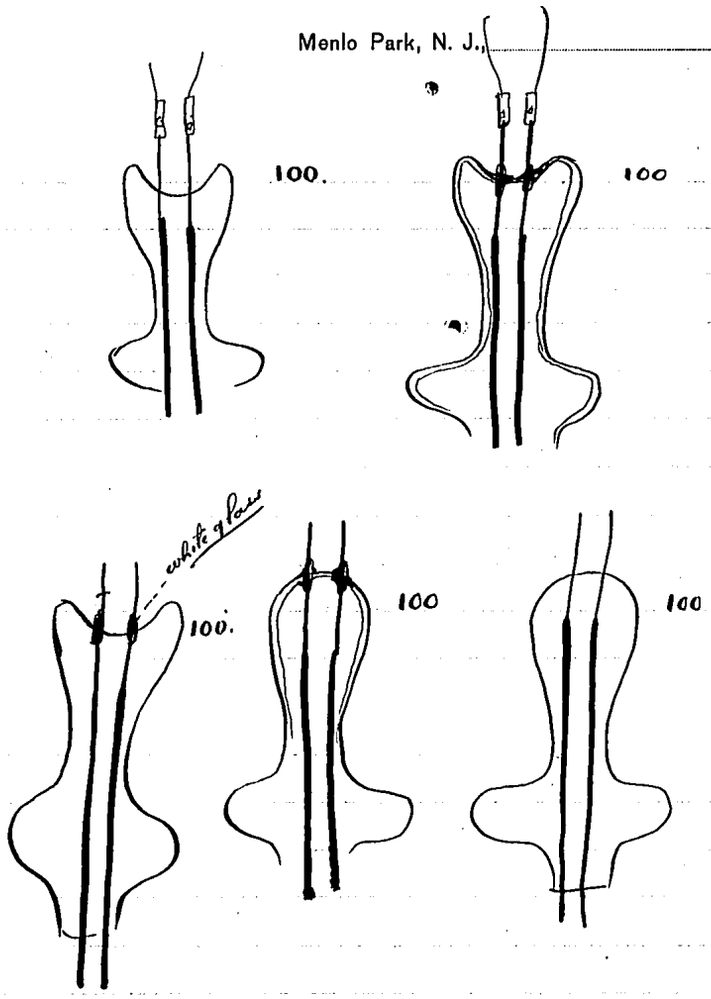
There is not a lever but a spring.





T. A. EDISON,

Menlo Park, N. J., 1880.



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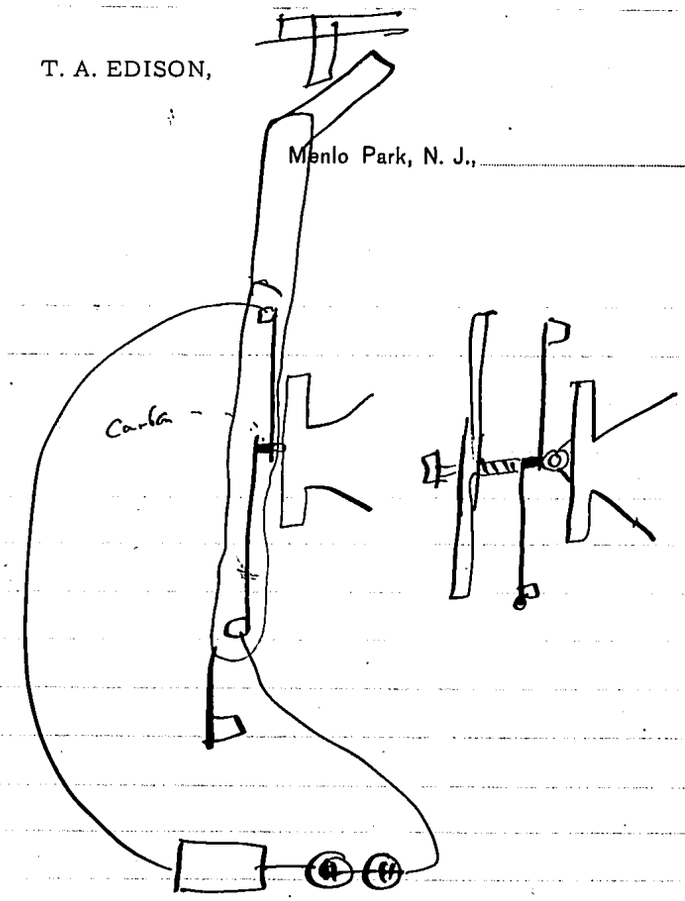
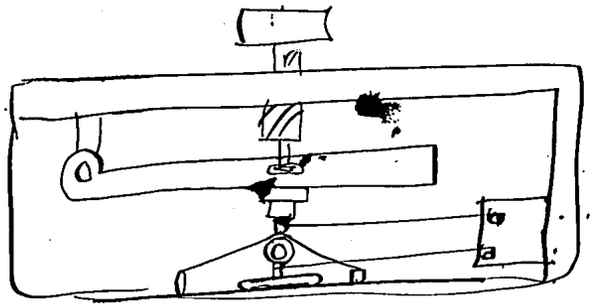
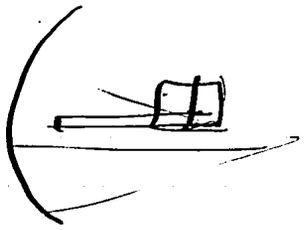
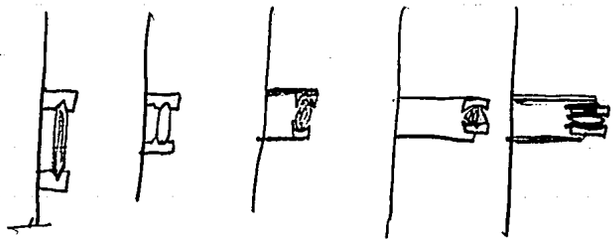


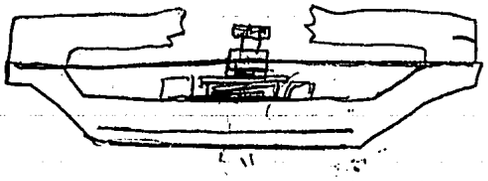


T. A. EDISON,

Menlo Park, N. J., *1880.*







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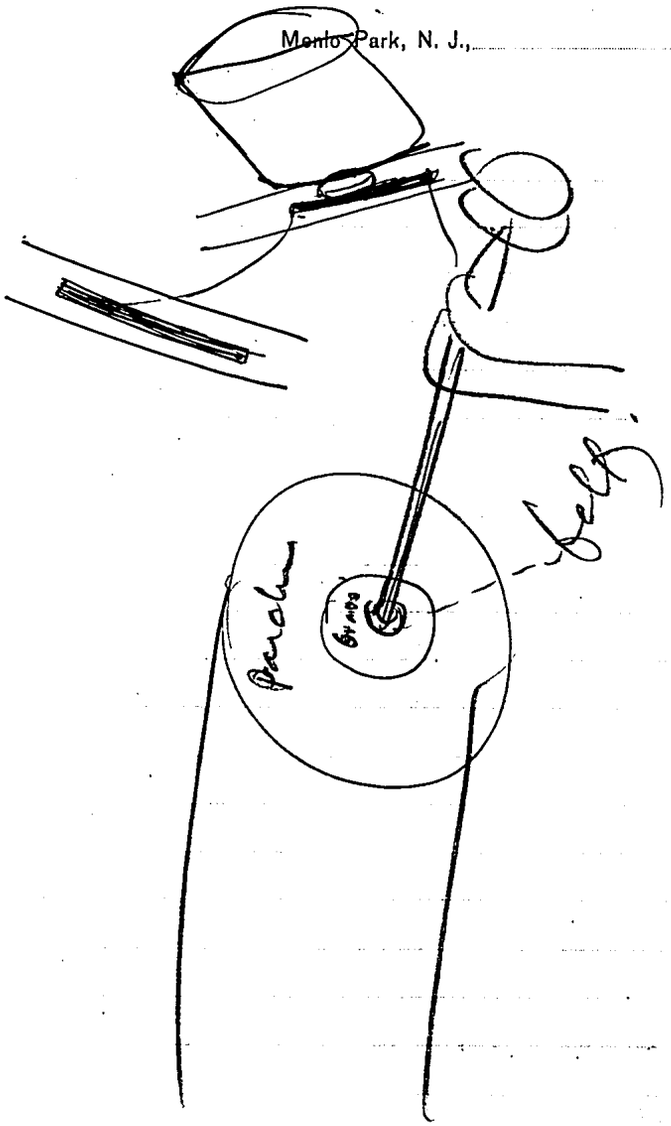

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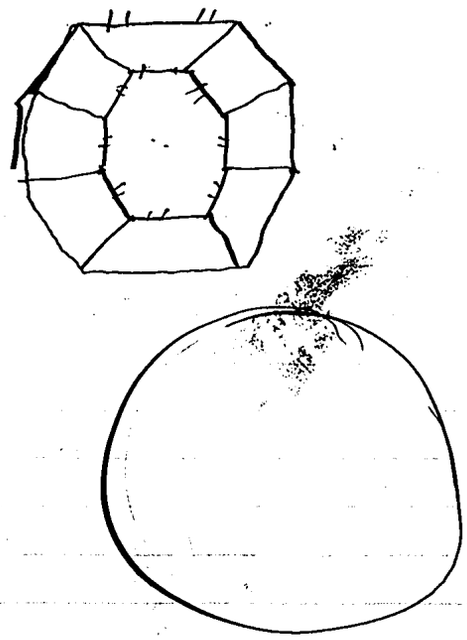
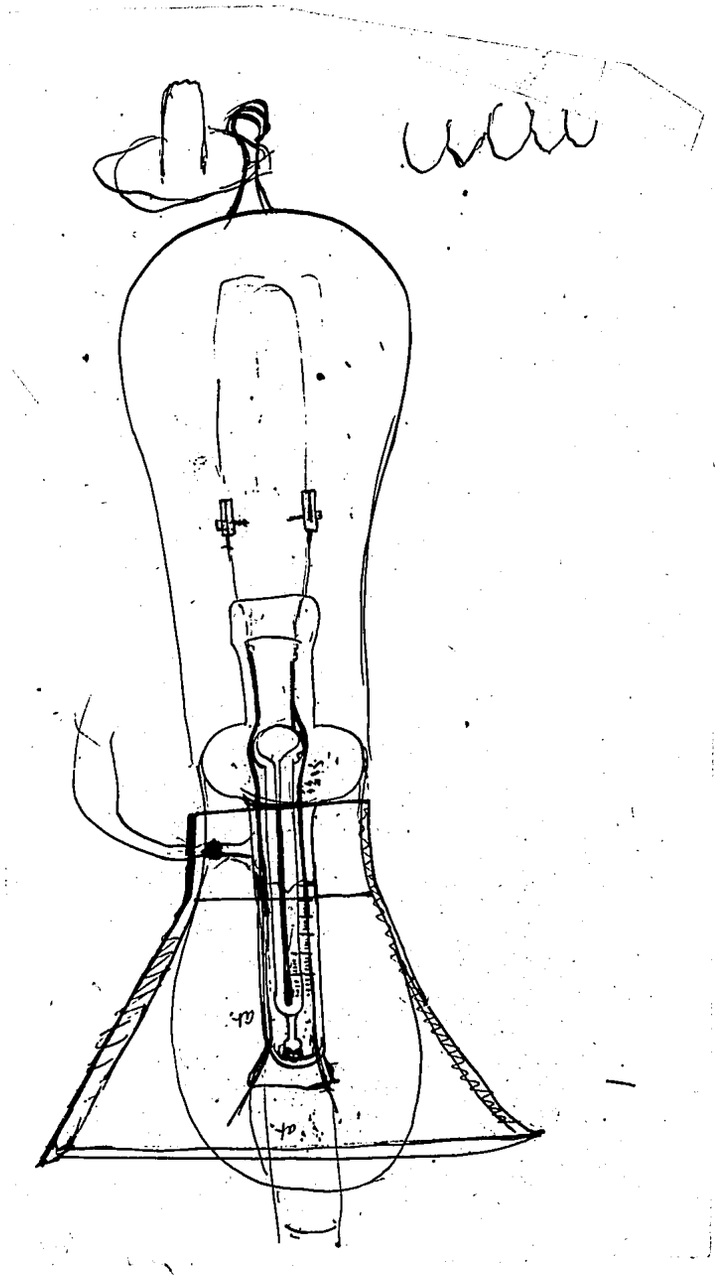




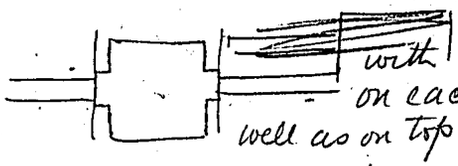
Notes on New Cylinder

Make 49 coils of 3 layers each of 4 turns

#18 cotn Cov. wire

Make 1½" shaft –

Make wooden bobbin so:–



and fill up with iron wire ⅛ on each side as well as on top.

Bobbin must be permanently fastened to shaft and the rubber heads must be firmly secured to the wood.

Make the rubber heads so large that they can be cut in the depth of 3 layers

JW/R

E.L.

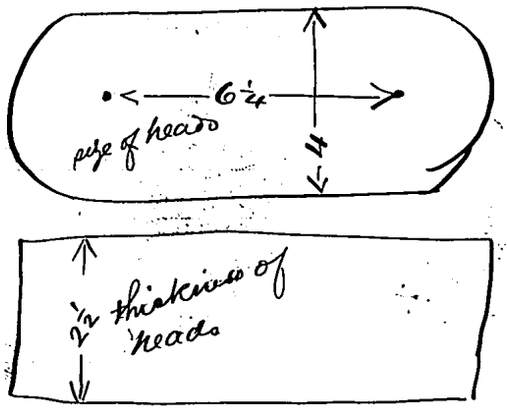
58
9.8
46
.75
5.0.8 H
22936

Mr. Thos. Gill
Winnipeg Man.
1.4.1
Canada

T. A. EDISON.

Menlo Park, N. J., 187

Kruesi



Kruesi

the cores for the new coils must be of cast iron also the heads, the cores must be 13 inches long and 3 inches thick and the heads of which there are 4 must be 4 inch wide 6¼ between centres and 2½ thick

4 cores
4 heads.

(Make patterns of these & send them 13.

T. A. EDISON,

Menlo Park, N. J., 1880.

For English. —

No 12 "Improvements in Carbons for Electric Lamps and in Means and Methods of Manufg the Same" —
Made up of Amin appns Nos 210, 215, 216, 219, 229, 230 and 233. —

No 14 "Improvements in Electric Lights" Nos 220, 227 & 228.

No 15 Improvements in Systems of Conductors for the Distribution of Electricity for Light and Motor Purposes" Nos 235 and 236. —

T. A. EDISON, Elec. Meter 3

Menlo Park, N. J., _____ 1880.

in the upper diagram. The wire W serves to short circuit the ~~sparks~~ arc which would otherwise ~~[illegible]~~ ~~[illegible]~~ spring between the points T when the current was broken and also to prevent the armature with the break circuit from acting as a vibrator.

From the binding nut D ~~the~~ a small portion of the current passes through the ~~[illegible]~~ ~~[illegible]~~ deposition cell K ~~where~~ which is so constructed that every unit of current passing will ~~[illegible]~~ deposit an amount of copper proportionate to the current flowing on a plate of copper

Menlo Park (1880) Pat. (Com)

What is a lever?

"A body movable about a fixed axis and acted on by forces is called a lever (Fr. levier, Ger. Hebel)"

Weisbach. (Cox) 265

"A lever is a rigid bar of wood or of metal movable about a fixed point or edge called the fulcrum; and subject to the action of two forces which tend to move it in opposite directions."

Ganot, $\frac{24}{522}$

"A beam or rod of any kind, resting at one part on a prop or axle as a center of motion, is a lever; and it has been so called, probably because such a contrivance was first employed for lifting weights (levo, to lift in Latin)"

Arnot: $\frac{123}{883}$

"A lever is a name given to any bar straight or curved resting on a fixed point or edge called a fulcrum"

Ganot. $\frac{22}{949}$

"A lever is a rigid rod movable about a fixed point, acted on by two or more forces, which tend to move it in opposite directions."

Weinhold $\frac{83}{848}$

T. A. EDISON,

Menlo Park, N. J., 1880.

"A straight bar or knee shaped body supported upon a fixed angular bearing, about which it can turn; two forces act on the bar on the one or the other side of the support: their equilibrium is to be studied.

Reuleaux $\frac{276}{622}$

The lever is a rod or bar which can turn in one plane about a point in the rod called the fulcrum

Todhunter Vol. 1 $\frac{75}{386}$

Lever is an inflexible bar, supported in one point, called the fulcrum or center of motion.

Nystrom, $\frac{254}{511}$

The lever is an inflexible bar, by the application of which one force may balance or overcome another.

Roper. $\frac{596}{698}$

A rigid body moving around a fixed point in itself, and acted upon by opposing forces.

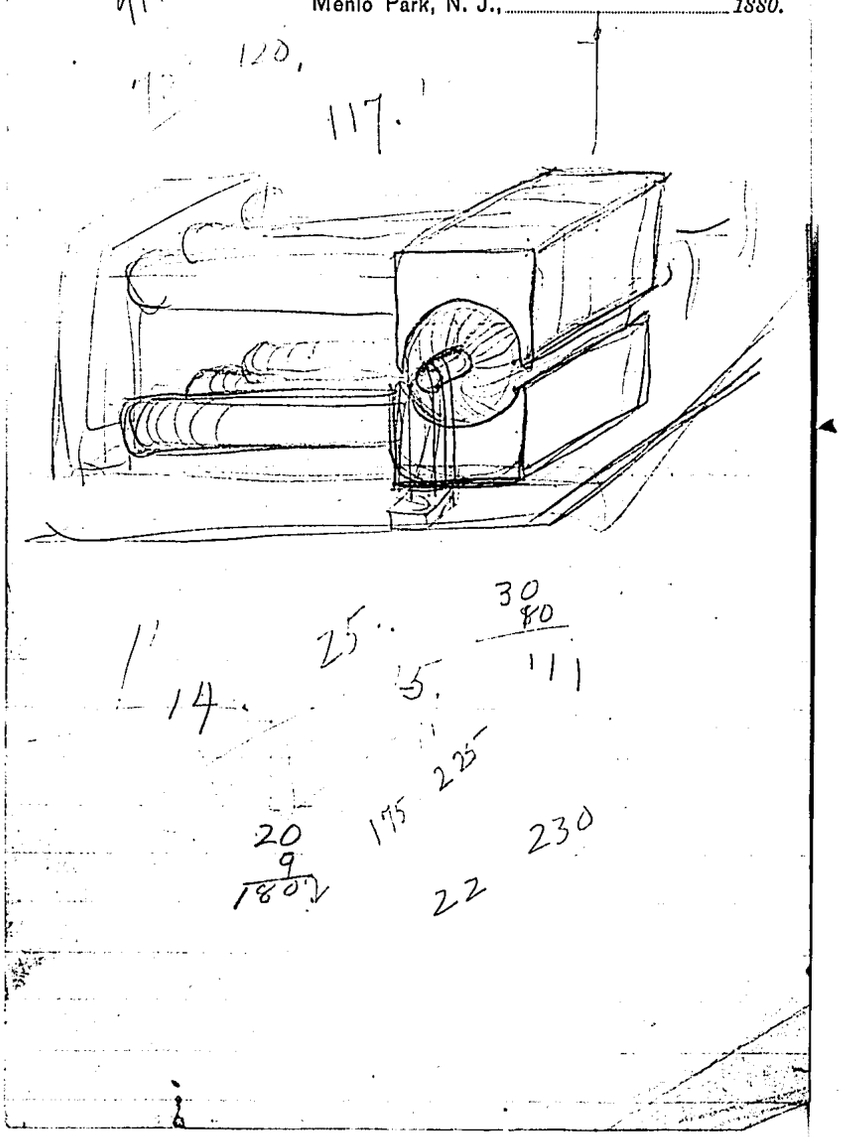
Q.4m.

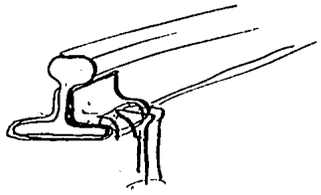
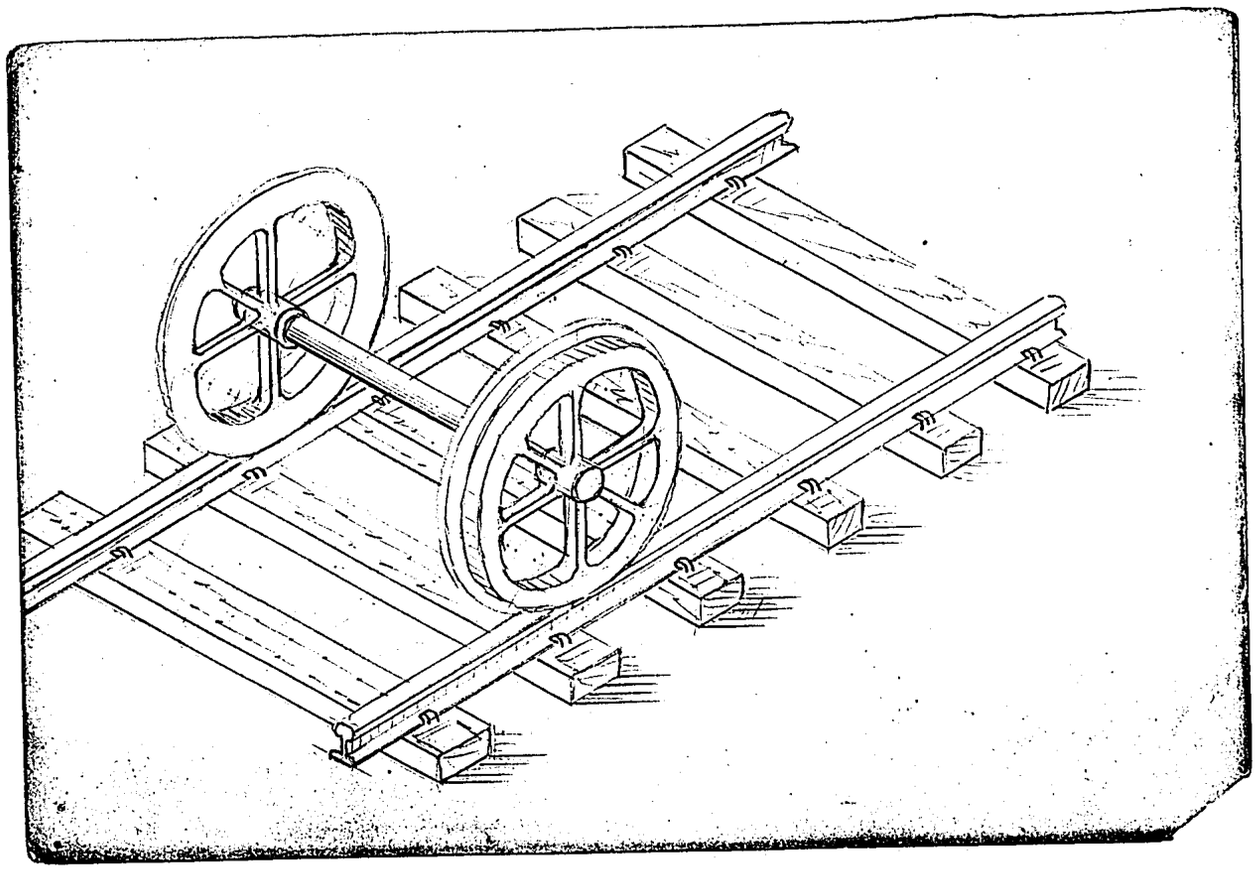
A lever is a rigid body free to be revolved around a single point; and the amount of work expended at any point in this body will be returned at any other point.

C.L.C.

T. A. EDISON,

Menlo Park, N. J., 1880.



T. A. EDISON,

Menlo Park, N. J., 1880.